THE TIMES

FARADAY NUMBER

Monday, September 21, 1931

CONTENTS

FARADAY

To-day men of science and electrical engineers are assembled in London to celebrate the centenary of what, judged by modern standards, was a very simple experiment. A little more than a hundred years ago **Michael Faraday**, working in his laboratory at the Royal Institution in Albemarle-street, took an iron ring and wound two separate coils of wire round its two halves. The ends of one wire he connected to a galvanometer, and those of the other to a voltaic battery, and he then found that when he made or broke the battery circuit in one coil the galvanometer indicated the passage of a transient current in the other. Thus, on August 29, 1831, he demonstrated the production of electricity from magnetism. It was no chance discovery. For years he had been searching for the effect, but always he had to end the account of his experiments with the unhappy words "No result." At this period intense interest was being shown in the relations between electricity and magnetism. Ten or eleven years before, **Oersted** in Denmark had discovered that a magnetic needle was affected by an electric current passing in a wire placed alongside it. Soon afterwards, in France, **Ampère** announced the existence of a dynamic action between conductors carrying electric currents, and **Arago** discovered the power of an electric current to magnetize iron or steel, as did **Davy** independently in this country. **Faraday** himself, in 1821, contrived an ingenious arrangement by which a wire carrying a voltaic current was made to rotate round a permanent magnet, and in doing so he constructed what in fact was the first electric motor. There was thus abundant evidence that electric currents could produce magnetic effects, and it seemed to **Faraday**, as indeed to other investigators, that there must be a reciprocal action, that it should be possible, in his own words, to "convert magnetism "into electricity." Proof of the existence of that action, however, eluded him until his successful experiment with the iron ring, and then he began to understand why his previous efforts had failed. On August 30 he put to himself the question whether the transient effects he had observed might not be "connected with "causes of difference between powers of "metals at rest and in motion." Seven weeks later he obtained a conclusive answer by finding that an electric current was produced when a bar magnet was moved into or out of a helix of wire, and a few days afterwards he constructed an actual magneto-electric machine by making a copper disk turn round between the poles of the great horseshoe magnet of the Royal Society. Thus in ten days of brilliant experiment, spread over a period of less than ten weeks, he elucidated the essential principles of electro-magnetic induction and laid the foundations of the vast fabric of electrical engineering as we know it to-day. His little electric machine was the forerunner of the dynamo by which mechanical motion is converted into electrical power, and his iron ring with its two coils of wire was the prototype of the closed transformer by which the pressure of the current can be raised or lowered at will, so that in these two pieces of apparatus he produced two of the principal elements of a modern electricity supply system. A third, the electric motor, by which electrical power is reconverted into mechanical motion, he had invented ten years before.

If **Faraday** had not made the discovery of electro-magnetic induction, and no one else had made it, the world to-day would indeed have been able to enjoy some trivial applications of electricity, such as electric bells and the electric light of the pocket flash-lamp, for which the feeble currents of the primary battery are sufficient, but there would have been none of the applications that depend on heavy currents generated by electro-magnetic machinery—no general illumination by the electric light, no electric traction, no electrically driven factories, no electric furnaces, no great electro-chemical industries. Measured by purely utilitarian standards the work which is being commemorated this week may therefore fairly be accounted his greatest achievement; but it may be doubted whether he himself would have been content to have it judged solely by the criterion of practical usefulness. He was very far from despising the application of science to practice, and that he would be gratified could he know of the material results that have been developed out of his experiments of a hundred years ago may be inferred from the story told of him that when he was shown an electric lamp he exclaimed: "I "gave it to you a baby; you have "brought it back to me a giant." But the abiding purpose of his life was the pursuit of scientific truth for its own sake, the desire to wrest her secrets from Nature and *rerum cognoscere causas*. He was a very prince of experimenters, an expert manipulator who could do wonders with simple and even crude equipment; but it was not without the fullest justification that he liked to describe himself as an experimental philosopher, for, as **Lord Rutherford** points out in one of the articles we publish to-day, he sought not merely to accumulate new facts but also to understand the physical processes underlying the phenomena he observed. His range was astounding, extending over the whole gamut of the physical sciences, and there is scarcely one of them to which he did not make some notable contribution. Some branches he established on a foundation so sure that later investigators have been left only to enlarge the structure built upon it; in the case of others there are to be found in the records of his work hints or anticipations of discoveries or ideas which only long after his death became prominent in scientific theory, as, for example, his near approach to a realization of the atomic nature of electricity. His work throughout was infused by his conviction of the essential unity of all the forces of Nature, by his belief that the various forms in which those forces are made manifest are so directly related and mutually dependent that they are convertible one into another. It was his search for proof of the convertibility of magnetism into electricity that led him to his great discovery of electro-magnetic induction, and his last experiment, which failed only because the apparatus at his disposal was insufficiently delicate, was the quest for another relation, additional to one he had discovered seventeen years before, between magnetism and light.

In these days, when mathematics plays so large a part in physical inquiry, it may seem strange that so gifted an investigator as **Faraday** never used a mathematical symbol, and indeed was wont to deplore his "imperfect mathematical "knowledge." Yet in fact he had a mathematical mind of a very high order, and it was in translating his conceptions into mathematical form that his great interpreter, **Clerk Maxwell**, gave the world what **Sir J. J. Thomson** describes as the most important equations in physical science. But if an attempt is made to discover how it was that he had that mind and possessed such wonderful powers of insight into physical processes no satisfactory answer can be given, and it can only be said that genius is born, not made. Heredity supplies no explanation, for so far as is known his forebears were very ordinary people, showing no signs of intellectual eminence to be handed down to their descendants. Nor can an explanation be found in his nurture or education. He once said of himself that he was "not an educated man, "according to the usual phraseology," and that is true in so far as he owed little to formal scholastic instruction. He ended his schooldays at the age of thirteen, and, as genius always does, he educated himself, by reading everything that passed through his hands as a bookbinder's apprentice and by attendance at such scientific lectures as were available. Partly perhaps because he had not been brought up in the humanities that were then thought essential to a liberal education—it may be recalled that when the British Association met at Oxford in 1832 resentment was expressed in certain quarters that the University had demeaned itself by receiving a "hotchpotch of philosophers" and conferring honorary degrees on four of their number, of whom he was one—he held views on the advantages of teaching science in schools which were far in advance of his time. His own position as a teacher is a little difficult to assess. He was indefatigable in giving lectures at the Royal Institution, where he started the famous Friday evening discourses and the Christmas lectures "adapted to a "juvenile auditory," which have now a history of more than a century behind them, and by the general agreement of those who heard him and contemporary lecturers he was supreme among them all. On the other hand he was essentially an individualistic inquirer who could not "work by students or pupils," and he was never the leader of an enthusiastic band of disciples inspired by its master's mind and disseminating his methods and doctrines. To such a man the Royal Institution offered a peculiarly congenial environment. It has always been a place where original investigators could pursue their researches as the spirit moved them, untrammelled by the routine of the classroom or the distractions of administrative duties, and if it had done no more than provide opportunities for a **Faraday**—there are many other distinguished names on its roll—it would have deserved well of this country and of the world.

MICHAEL FARADAY, 1791–1867

A MODEST SEEKER AFTER TRUTH

THE SECRET OF HIS GREATNESS

By Rollo Appleyard

Michael Faraday was born in London on September 22, 1791. He made his most famous discovery on August 29, 1831. On August 25, 1867, he died. With the exception of Sir Isaac Newton—whose *Principia* is ever to be regarded as the highest pinnacle of human genius directed to observation and measurement—Faraday, on account of his researches, teaching, zeal and nobility of character, is universally acknowledged transcendent in the realm of natural philosophy. This year, while celebrating his achievements and while standing amazed at the wealth of developments therefrom, it is proper to remind ourselves that he was in the highest sense a philosopher, a modest man of simple faith who, with all his might, sought the truth and to do good. The early environment of Faraday was poverty, his primary education was meagre in the extreme. For him there was neither college nor university. He began at the *world's rough edge*.

Both on his father's and his mother's side, Michael was from the stock of English yeomen and craftsmen. The name appears in the register of the parish church of St. James, in Clapham village, Yorkshire, notably in 1740, and the entries there associate the Faradays with the family of Dean, of Clapham Wood Hall. The site of this Hall is nearly three miles from the church. It is reached by following the road from Clapham railway station towards Slaidburn as far as a signpost, and there turning to the right, towards Bentham. The Hall is no more, but there remains a modest farm dwelling, still known as Clapham Wood Hall; and the small estate has upon it two detached buildings, one the "Home Barn" and the other—now a religious meeting house—the "Cotton Mill" or "Bobbin Mill," all associated formerly by deed with the Faraday family. For the present purpose it suffices to observe that Michael's grandfather, Robert Faraday, who was born in 1728, married in 1756 Elizabeth Dean, of Clapham Wood Hall, and had seven sons—Richard, John, James, Robert junior, Thomas, Barnabas, and William. He also had three daughters—Elizabeth, Jane, and Hannah. Of the sons, Richard is described variously as a yeoman, innholder, slater, and grocer. John changed from farmer to weaver. James was always a blacksmith. Robert junior changed from tailor to a packer in a flax mill. Thomas and Barnabas remained cordwainers. William died young. In 1800 the daughters were all unmarried.

The father of Michael was old Robert's son, James, the blacksmith, who in 1786 married Margaret Hastwell, a farmer's daughter of Mallestang, near Kirkby Stephen, in Westmorland. There are folk in Clapham, Yorkshire, who would like to claim Michael for their lovely village, but the facts are too definite that James and Margaret came south and made their home near the junction of Walworth-road with Newington Butts, London, close by the old church—since demolished—of St. Mary Newington. The site of the blacksmith's shop was not far from what was then Cross-street and is now Draper-street, but the dwelling-house in which Michael was born has not been identified.

To a casual observer at that time the choice of position at the meeting of the two great highways from the south into London was all that could be desired by a blacksmith. There was, however, considerable distress in the locality. Also there is evidence that the hopes of the Faraday family in the Yorkshire homestead had somewhat withered; the results of their industry had been disappointing. *By the year 1796 James and* Margaret had a young family of three children—Elizabeth, born in 1787, Robert in 1788, and Michael in 1791. With these precious belongings they betook themselves to the other side of the Thames, to the obscurity of Jacob's Well-mews, near Manchester-square. The father was in ill-health, and the conditions under which they existed can only be imagined. In 1802 the fourth child, Margaret, was born. So far as can be ascertained, Michael picked up the rudiments of reading, writing, and arithmetic at a local day school, and at the age of 13 he obtained work as a newspaper boy at the shop of Mr. Riebau, a bookseller, of No. 2, Blandford-street, Marylebone.

For particulars of Michael at this early stage of his career there is no better authority than Bence Jones, who, in 1870, wrote "The Life and Letters of Faraday." The period from 1850 to 1867 is described by John Tyndall, who left an impression of Faraday as a discoverer. In some respects, more intimate knowledge of him is to be derived from Dr. J. H. Gladstone's "Michael Faraday." Biographies of certain of his scientific friends contain personal details. The most valuable record of his scientific achievements is his own immortal work "Experimental Researches," to which must be added his diaries, note-books, commonplace-books, and correspondence, treasured chiefly in the libraries of the Royal Institution and the Institution of Electrical Engineers. Aspects of his history are also to be obtained by turning back the pages of journals, particularly *The Times*, *Punch*, the *Illustrated London News*, and *St. Paul's Magazine* of 60 or 100 years ago.

The family of Michael's grandfather were Sandemanians—the religious sect to which Michael to the end owned allegiance. The Sandemanians followed closely the doctrines of the Glasites, one of their tenets being that the Bible was never designed to teach mankind philosophy; they exhibited considerable strength of character, and they held it to be the common duty of the Church to maintain all its members. An instructive account of them is to be found in the Dictionary of National Biography. The parents of Michael inculcated in their son high and manly principles. After a year's trial as a newspaper boy, his master discovered his qualities, and on October 7, 1805, accepted him as an apprentice—without premium—for seven years to the trade of bookbinder and stationer. At the end of his apprenticeship he served another master as a journeyman bookbinder, but the youth became restless—the spell of natural science was upon him.

By reading the books he had to bind and to sell he was attracted to the study of chemistry and electricity, and he began to make experiments. In 1810 and 1811 his brother Robert assisted him to pay a shilling a week for lectures on these subjects at 53, Dorset-court, Fleet-street. Michael also received from a friend a few lessons in drawing and perspective. Moreover, in February, March, and April, 1812, he was taken by one of the customers at the bookshop to hear lectures by Sir Humphry Davy at the Royal Institution, in Albemarle-street. The story of the consequences is well known: he sought an interview with Sir Humphry and produced notes of the four lectures, which he had neatly written and bound. This resulted, on March 8, 1813, in his being appointed as an assistant in the laboratory of the Royal Institution. He was paid 25s. a week, and he had the use of two rooms at the top of the building. He now applied himself to study. He was intent upon literature, music, elocution and all that could make him a worthy citizen. He determined upon a severe course of self-education, but circumstances intervened to modify his purposes.

Sir Humphry Davy in 1813 asked him to accompany him on a tour through Europe. Lady Davy and her maid were to complete the party, and they were all to travel under a safe-conduct ascribed to the magnanimity or shrewdness of Napoleon. It was to be a journey of scientific inquiry, through France, Italy, Sicily, and Germany. They were to take with them apparatus for their researches. They were to visit the Auvergne to examine extinct volcanoes, and Montpellier for certain investigations concerning iodine. This strangely assorted four—Davy, Lady Davy, Faraday and the maid—embarked at Plymouth for Morlaix on October 17, 1813, by cartel, a vessel probably of about 40 or 50 tons. Upon arrival in France they packed their apparel and apparatus into their travelling carriage and proceeded to Paris. The French treated them generously, and gave Faraday a passport in which he found himself described as the possessor of "a round chin, a brown beard, a large mouth and a great nose." Considering the state of Europe at the time, the tour was a courageous exploit. Its consequences were important, not only because of the researches carried out by Davy, but because it brought Davy and Faraday into direct touch with progress on the Continent. A year later Davy referred to having, on this tour, passed from the Pyrenees to the Alps, twice crossed the Alps, visited extinct volcanoes, met Ampère and Gay Lussac, Berthollet, Cuvier, Humboldt, Chevreul, and others, journeyed to Rome, Florence, Naples, and Milan, and conversed with Volta and De la Rive.

Michael suffered at first on account of the menial position in which occasionally he was placed. Another disturbing element, upon his return to London, was the chance that he might be selected to take up researches in Naples on the unrolling of the papyri of Herculaneum. This phase of uncertainty, however, ultimately passed away; in 1815 he became Assistant in the Laboratory and Mineralogical Collection, and also Superintendent of Apparatus. As the result of what he acquired from Davy and others he advanced rapidly, so that by 1819 he was taking pupils and was fully occupied with laboratory work and scientific meetings. His self-education included "composition, style, delivery, reading, oratory, grammar, pronunciation and perspicuity." Meanwhile, his devotional exercises were never neglected, and it remained his custom, however pressed by duties at Albemarle-street, to visit on Saturdays his mother and sisters. Fortunately, also, the labour of recording in diaries, note-books, and commonplace books his results and observations of importance was never shirked. He studied carefully what others published concerning physical and chemical progress; and in that direction, as in all in which he set his mind, he established a standard of excellence. Yet he was blithe of heart. He would sing and laugh and play—when he could. He was occasionally to be seen riding round and round inside the theatre of the Royal Institution on a velocipede, which was then "a new thing."

In 1820 his notions of existence suffered change. There was at the Sandemanian Church an elder, Mr. Barnard, a silversmith of Paternoster-row, whose third daughter, Sarah, by argument or otherwise, converted Michael from error touching the nature of human affection. Upon hearing of this Mrs. Barnard withdrew Sarah to Margate; Michael followed, and although his mind, as he said, "was in a quandary of stupidness, chlorides, trials, oils, Davy, steel and fifty other fancies," he was convinced that Sarah was right, and they were married on June 12, 1821. Davy was instrumental in enabling him to make a home for himself and his wife at the Royal Institution, where Michael had just been promoted to Superintendent of the House and Laboratory.

From that time to the end of their days the romance is a simple tale of two devoted lovers. Their happiest hours were when they sketched in country lanes together, or when they wandered unobserved into the pit of a theatre. Occasionally they were at the opera, or they joined in a merry river picnic party. Their circle at last extended far beyond the scientific fraternity; it included the leading musicians and artists, among whom were Garcia, Malibran, Stanfield, Turner, Westall, and Landseer. About Faraday there was nothing pedantic or dull. If there was a cloud it was the thought of the absence of children to share the sunshine and to watch the rainbows.

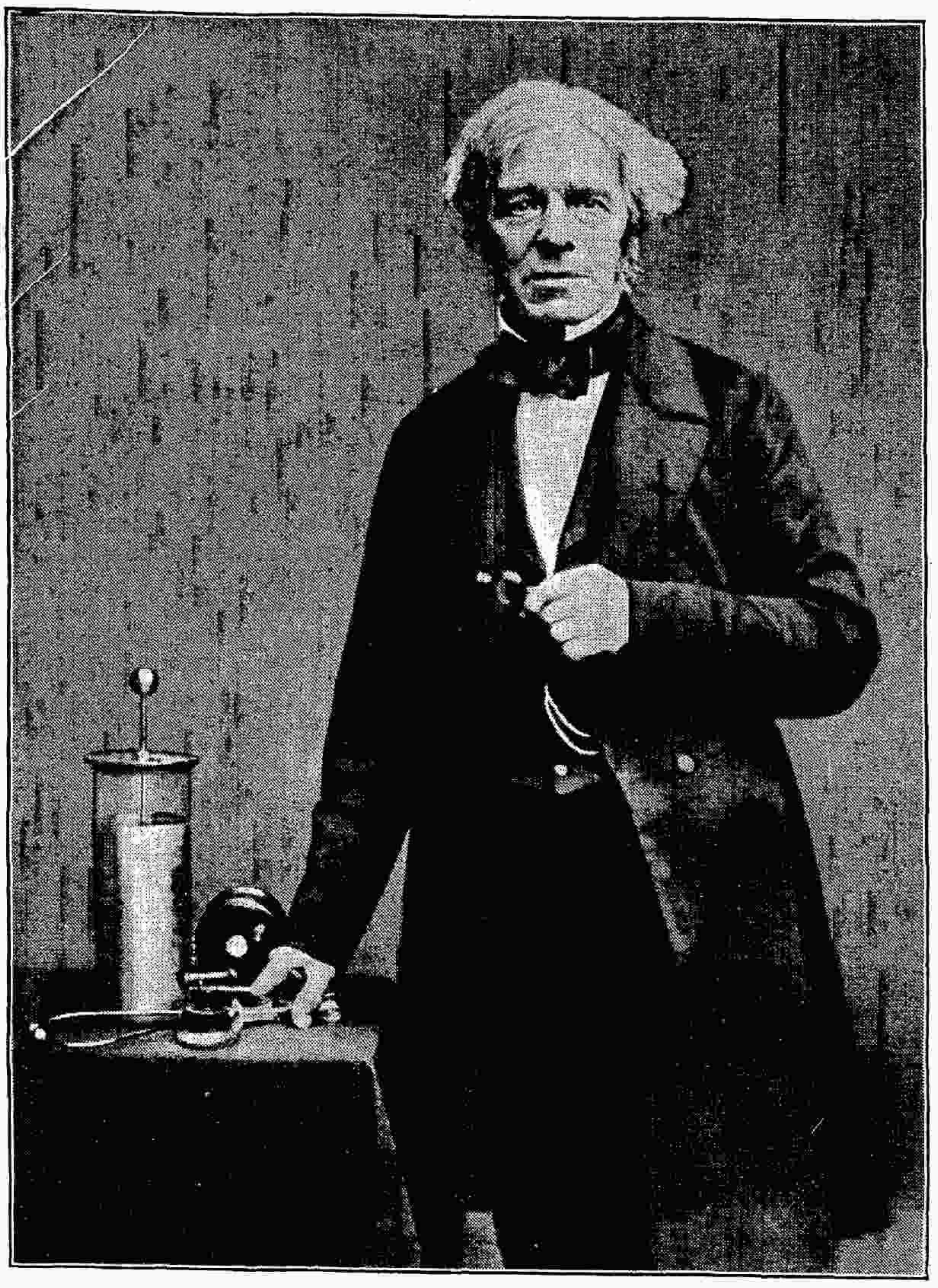
His success was the result of intense effort exerted over many years. He was quick to appreciate the extent of the unexplored territory that Henry Cavendish, Thomas Young and others had mapped out, across which Volta, Ampère, Gauss, and Oersted had cut paths. Moreover, he was a chemist as well as a physicist, and what he lacked in mathematics he compensated for by giving play to his vast powers of imagination, restrained and guided by a logical mind with profound reverence for truth and justice. Like his father's sledge upon the anvil, he beat out the facts of natural science and shaped them for co-ordination. The effort demanded much of him—too much—for by 1835, when he was world-famous and universally esteemed as a philosopher and a lecturer, his health began to fail. In 1841 he tried to gain strength by a tour in Switzerland, but on his return to England he was depressed, and lost some of his power of memory. Against these dread symptoms he struggled manfully, and he applied himself with all the ardour he could summon to further researches: but at last he became paralysed, and on August 25, 1867, he sank, as Tyndall tells us, towards his final rest.

It was characteristic of Faraday that to ensure justice to other philosophers the precise nature of the successful experiments he made on August 29, 1831, was explained with extreme care. He did not discover electro-magnetic induction. In his own words (p. 2, Vol. I. of "Experimental Researches"), he was led by "the hope of obtaining electricity from ordinary magnetism." He knew that: (1) in 1819, or early in 1820, Oersted had demonstrated the deflecting influence of an electric current upon a magnetic needle; (2) on September 18, 1820, following upon Oersted, Ampère had demonstrated that two electric currents in neighbouring conductors exert mechanical forces upon each other; (3) on September 20, 1820, Arago had magnetized steel needles within a wire helix conveying an electric current; (4) on May 21, 1821, Sir Humphry Davy had demonstrated, perhaps not for the first time, that an electric arc could be deflected by a magnet; (5) on November 22, 1824, Arago had observed the "damping" of the *oscillations of a magnetic needle* placed above and near to a conducting surface such as a sheet of copper. The first volume of Faraday's "Experimental Researches in Electricity" contains his review in 1831 of this work of others, and his remark that "still it appeared unlikely that these could be all the effects which induction by currents could produce." It is there that he records his own achievement—how (page 14) by the use of iron "the magneto-electric induction was rendered sensibly greater," and he is able (page 15) to add "the various experiments of this section prove, I think, most completely the production of electricity from ordinary magnetism."

A hundred years have elapsed since that wondrous result was published. Are we certain of the way in which he carried out the experiment that first revealed the effect? Tyndall at page 21 of "Faraday as a Discoverer" tells us that Faraday "began his experiments 'on the induction of electric currents' by composing a helix of two insulated wires, which were wound side by side round the same cylinder of wood." Faraday himself at page 2 of Volume I. of his "Experimental Researches" begins his description of the apparatus by explaining how he proceeded with a helix of copper wire wound on a cylinder of wood. This probably accounts for Tyndall's version, but did Faraday really first achieve *success* by experimenting with a core of wood, or was it with a core of iron? Faraday's manuscript diary for August 29, 1831, the ultimate authority, records the first successful experiment and clearly depicts and describes an iron ring constituting the core of the wire helix. Upon this experiment he had determined to concentrate all his knowledge and all his resources. He knew the magnetic virtue of iron, for he was a philosopher; he knew how an iron ring could be constructed, for he was the son of a blacksmith. By the dictates of his genius he became aware that this device would enhance his chances of success. Why then did he not record it in his printed account as the first of these experiments? Explanation is to be found in the short paragraph on page 2 of Volume I., where he says: "These results I propose describing, not as they were obtained, but in such a manner as to give the most concise view of the whole."

The activity of Faraday in the laboratory, his skill as an experimenter, his eloquence as a lecturer, his success in establishing good fellowship among men of science, and his renown as a discoverer, are all well known. It is proper to add his influence in the reform of the educational system, his plea for the inclusion of natural science in what is taught in public schools, his insistence upon the recognition of the status of the leaders in scientific progress, and, above all, his devotion to his country. He was Scientific Adviser to Trinity House, and laboured constantly to improve lighthouse illumination. He refused a professorship of chemistry at London University, but he became one of the Senate. He accepted, however, a lectureship of chemistry at the Royal Military Academy, Woolwich. His own mode of stating his attitude was that he always held himself ready to assist the Government, though "not for pay." He said: "I have the honour and pleasure of applications . . . from the Admiralty, the Ordnance, the Home Office, the Woods and Forests and other Departments." The calls upon his time by home and foreign correspondents asking for his guidance were innumerable. With all that remained of his strength he sought to reply helpfully.

Whoever will study Faraday's life will be grateful that his Irish friend Tyndall was inspired to tell posterity so eloquently its secret: "Beauty and nobleness coalesced, to the exclusion of everything vulgar and low. He did not learn his gentleness in the world. . . . Still this land of England contained no truer gentleman than he. Not half his greatness was incorporate in his science, for science could not reveal the bravery and delicacy of his heart."



A PORTRAIT of Michael Faraday, "the Prince of Experimenters," taken in later life. Few men have accomplished so much for the ultimate progress of the human race.

COMMEMORATION PLANS

EXHIBITION AT THE ALBERT HALL

FLOOD-LIGHTING OF BUILDINGS

London, *in the name of the whole world* of science, is paying worthy tribute to the genius of Michael Faraday. Men of science of many countries are assembled here to honour his memory and achievements. The Faraday Exhibition, which is to be opened this week in the Albert Hall, will display the miracles of invention—evolved throughout a century notable for mechanical progress and radiating across *the earth in many forms—that have sprung from his first experiment a hundred years* ago in the production of electricity from magnetism. The British Association, under the presidency of General Smuts, is holding its centenary meeting in London during this period of commemoration. But the most spectacular celebration of the centenary of Faraday's greatest achievement, although it is not designed for that special purpose, has been in progress since the beginning of the month, and has been visible to London's millions. The flood-lighting upon which we have looked with delight during the last three weeks is, for the greater part, one aspect of the immense superstructure of applied invention that has been erected upon the foundations of his researches. There is direct connexion between Faraday's patient work in his secluded laboratory and those nocturnal pictures of dazzling beauty created by the concentration of powerful illuminants upon the most famous and conspicuous buildings of the Metropolis.

APPARATUS AND MODELS

If flood-lighting is spectacularly the most impressive part of the celebration, the exhibition in the Albert Hall is highly impressive in another way. No pains have been spared to make it worthy of a great occasion. The scheme of the exhibition, for which the Institution of Electrical Engineers have appropriately made themselves responsible and in which the Royal Institution have collaborated, is to represent side by side the actual experiments made by Faraday and the immense developments which have been evolved out of his discoveries. Perhaps the best approach to the exhibition is by way of the realistic full-size reproduction of Faraday's laboratory. The work of erection was carried out by the Wellcome Historical Medical Museum. This small chamber, in which imagination can conceive the great investigator at work, is a kind of ante-room to the hall itself, where the various fruits of his labours are set out on a big array of stands. The centre of the exhibition is a platform dominated by a statue of Faraday, and round it a collection of his personal relics. On the inner circle of stands surrounding the central platform is shown the personal work of the inventor. The Royal Institution have arranged this interesting part of the exhibition, and visitors will be able to see demonstrations of the actual experiments made by the man who is being commemorated. The outer circle of stands, forming naturally the larger part of the exhibition, has been designed to give as complete a representation as possible of the manifold applications of Faraday's electrical and chemical researches. It is all profoundly interesting to the specialist and the layman alike.

Many trading associations and other bodies have cooperated in this commemorative effort. The generation of *electricity, its transmission, distribution*, transformation; its industrial, commercial and domestic uses; these and many other phases of applied science are represented by apparatus and working models. A complete chain of processes, beginning crudely with coal delivery and reaching up to the refinements of radio telegraphy and broadcasting, is profusely and vividly illustrated, and visitors are shown how the national "Grid" system is linking up the power stations throughout Great Britain under the stimulus of the Central Electricity Board. In the radiology section of the exhibition there are shown the latest developments in X-rays and their application, and among the models is a reproduction of the Scottish regional transmitter for broadcasting.

The lighting of the Albert Hall—and here also a chain of connexion with Faraday is established—is highly decorative and beautiful. A velarium which covers the whole of the ceiling is flood-lighted from the gallery (only the floor of the hall is used for the exhibition proper) and the scheme of illumination includes a large central fitting 40 feet deep, suspended from the roof. Illuminated arches placed in a ring and lanterns on the gallery columns complete the picture.

BRITISH ASSOCIATION

These are tributes in tangible form to the memory of Faraday. His work and memory will also be commemorated this week in speech by men of science from all parts of the world, for whom an extensive programme of receptions and meetings has been arranged by the Royal Institution. First in the list of meetings is the gathering which has been arranged to take place to-day in the Queen's Hall, *where distinguished* representatives of scientific institutions in various parts of the world will speak of the services which Faraday has rendered to mankind. It is a happy conjunction of events that the meetings of the British Association are taking place in London at this time and that the delegates to the International Illumination Congress, about half of them from abroad, are able to participate in the celebrations.

On Wednesday afternoon General Smuts will formally declare the Faraday Exhibition open to the public, and in the evening he will deliver his presidential address to the British Association at the Central Hall, Westminster. On the following day the delegates and others will attend a garden party to be given at the National Physical Laboratory by Sir Joseph Petavel, the director, and in the evening there will be a *soirée* at the rooms of the Royal Society, Burlington House, invitations to which are issued by the president, Sir Frederick Gowland Hopkins, and the Council. On Friday the delegates and other guests will be entertained to dinner by His Majesty's Government at the Dorchester Hotel, Park-lane, where Mr. MacDonald, the Prime Minister, hopes to preside. This *will bring to an end* one of the most interesting and significant celebrations in the history of science in Great Britain.